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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/532,322	04/22/2005	Hiroyuki Yamamoto	10873.1662USWO	5060

52835 7590 03/10/2009
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EXAMINER	
WANG, EUGENIA	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
03/10/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/532,322	YAMAMOTO ET AL.	
	Examiner	Art Unit	
	EUGENIA WANG	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _16 January 2009_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _33-35,37-44,46-56 and 63_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _33-35,37-44,46-56 and 63_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment received January 16, 2009:

a. Claims 36, 45, 57-62 have been cancelled as per Applicant's request. Claims 33-35, 37-44, 46-56, and 63 are pending.

b. The previous claim objections have been withdrawn in light of the amendment.

c. The 112(2) rejections (except for the one directed at claim 33 and its dependents with regards to the mean flow pore diameter and bubble point pore diameter sizes) have been withdrawn in light of the amendment.

d. Similar positions with respect to the prior art have been taken. All changes made to the amendment are necessitated by the amendment. Thus, the action is final.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 33-35, 37-44, 46-56, and 63 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 33 claims that the mean flow pore diameter is 0.3-5 μm and that the bubble point pore diameter is between 3-20 μm. However, the two ranges contradict what the man flow pore diameter and bubble point pore diameter characterize. US 5,599,614 (Bahar et al.) is relied upon as an

evidentiary piece to show how each term is defined within the art. Mean flow pore diameter is linked to the mean pore size, while the bubble point is linked to the maximum pore size (col. 9, lines 55-67; col. 10, lines 1-3). Therefore, without defining how the ranges correspond to one another (i.e. that a mean flow pore diameter corresponds to 0.3 μm when the bubble point pore diameter corresponds to 3 μm), the ranges as defined are unclear, as it is uncertain how a mean flow pore diameter (average diameter) of 5 μm can have a bubble point pore diameter (maximum pore size) of 3 μm. Therefore, the ranges as applied to the structure of the separator are unclear and thus indefinite. Since claims 34-56 and 63 are dependent on claim 33, they are rejected for the same reason.

Response to Arguments

4. Applicant's arguments filed 1/16/09 have been fully considered but they are not persuasive.

Applicant argues that the mean flow pore diameter limits an average pore size to 0.3-5 μm, while the bubble point pore diameter limits a maximum pore size to 3-20 μm, wherein when a number of pores with a large diameter is small that the average diameter is much smaller.

Examiner respectfully disagrees and submits that Applicant has misunderstood the rejection, as the argument does not address the issue set forth. Examiner is not arguing that the indefiniteness is due to having average diameter (mean pore) is much smaller than that of the maximum diameter (bubble point pore). Examiner submits that within the range listed by Applicant that there are combinations wherein the maximum

diameter (bubble point pore) is smaller than that of the average diameter (mean pore). For example, one embodied point of the average diameter (mean pore) is 5 μm, and one embodied point for maximum diameter (bubble point pore) 3 μm. In this instance the claim language is stating that the *average* pore diameter is *larger* than the *maximum* pore diameter. It is uncertain how such an embodiment can exist, because the maximum diameter should not be smaller than that of the average diameter. Accordingly, such claim language is seen to be indefinite, and the rejection of record is maintained.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO98/32184 (Tsukuda et al.), as evidenced by US 5,599,614 (Bahar et al.), in view of either US 6057061 (Callahan et al.) or US 4309494 (Stockel). Note: US 6511774 is relied upon as an English translation for WO document.

As to claim 33, Tsukuda et al. teach of a porous separator for a lithium battery, wherein a nonwoven fabric is embodied as the type of porous base (abs). The separator taught by Tsukuda et al. is for use in a lithium battery, which has an organic electrolyte, as the battery fabricated with the examples and comparative examples are made of $LiClO_4$, ethylene carbonate, and diethylene carbonate (col. 51, lines 11-23). The porous base, wherein nonwoven fabric is embodied contains organic fibers (other fiber) such as polypropylene and polyethylene fibers (col. 9, lines 33-57). Tsukuda et al.

also embodies the use of a binder (gelling resin) when fibrillated polymeric organic fibers (polyethylene and polypropylene fit into this description) are used, wherein a polyvinyl alcohol, such as ethylene-vinyl alcohol copolymer is embodied (col. 13, lines 8-29 and 62-67).

It is noted that the gelling resin (binder of Tsukuda et al.) (a) is capable of gelling by heating in the presence of moisture and another fiber and (b) does gel under these conditions.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)

In the case of the instant application the basis for expectation of inherency is: With respect to (a) that the same gelling resin and other fiber as defined in Tsukuda et al. above are embodied by the instant application (see p 9, lines 17-28; p 11, lines 1-15). (Note: It is interpreted that with the teaching of Tsukuda et al. that since ethylene-

vinyl alcohol copolymer is a specific species in the generic polyvinyl alcohol species that all polyvinyl alcohols would act in the same manner under the same conditions, barring proof to the contrary.)

With respect to (b) same conditions of heat (by pressing) and humidity (water), as claimed, exist in Tsukuda et al., as water is included in the binder and that hot pressing occurs afterwards (see col. 13, lines 53-67; col. 17, lines 50-65).

The Examiner requires applicant to provide that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product.

Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

It is noted that the porous film has a maximum pore diameter of 10 μm, as detected using ASTM F-316-80 bubble point method and nonwoven fabric base has a maximum pore diameter of 20 μm (col. 5, lines 50-65).

It is noted that such a teaching inherently embodies a mean flow pore diameter of 0.3-5 μm and a bubble point pore diameter of 3-20 μm in accordance with ASTM F 316 86.

Although (c) the use of an ASTM F 316 86 standard is not specifically stated and (d) the mean flow pore diameter is not specifically stated, these two characteristics are seen as inherent.

The basis for inherency is:

With respect to (c), the tests of ASTM F 316 86 and that of the used ASTM F-316-80 measure the same thing and would thus report bubble point values that are similar. Therefore, the bubble point diameters of Tsukuda et al. (with one specific data point at 4 μm) should be close to, if not identical to that of the claim.

With respect to (d), US 5,599,614 (Bahar et al.) is relied upon as an evidentiary piece. Bahar et al. is used to show what mean flow pore diameter and bubble point diameter correspond to. Mean flow pore diameter is linked to the mean pore size, while the bubble point is linked to the maximum pore size (col. 9, lines 55-67; col. 10, lines 1-3). It is noted that since both Tsukuda et al. and the instant application are made with similar materials (polyolefin other fibers and polyvinyl alcohol gelling resin) and in a similar manner (wherein the separator is heat pressed) that the characteristic of mean pore size would be expected to be similar. The bubble point displayed by Tsukuda et al., similar to that of the claimed instant application, is an indication of this. However, it is also noted that examples 120-124 particularly embody a nonwoven base with polypropylene/polyethylene combination fiber as well as a polyvinyl alcohol copolymer, wherein the separator has a final maximum pore diameter of 4 μm as measured with the ASTM F-316-80 bubble point test (table 3; col. 47, lines 10-67; col. 48, lines 1-28). Accordingly, since the max diameter of Tsukuda et al. is 4 μm (as applying Bahar et

al.'s definition of what bubble point diameter corresponds to), then the mean pore diameter should be less than that in a manner wherein porosity is still expected (i.e. greater than 0.3 μm).

However, it is noted that an alternate obviousness rejections with respect to the above characteristics are made if it shown that Tsukuda et al.'s separator is shown not to inherently have the characteristics of a 0.3-5 μm and a bubble point pore diameter of 3-20 μm in accordance with ASTM F 316 86.

Alternately, both bubble point diameter and mean flow pore diameter are seen to be result effective variables, and accordingly, one of ordinary skill in the art would have found it obvious to optimize both values. The bubble point diameter (corresponding to the maximum pore diameter, as evidenced by Bahar et al.) is a result effective variable, wherein its size effects whether or not dendrites can penetrate the separator easily. The mean flow pore diameter (corresponding to mean pore size) is also a result effective variable, wherein not only does it affect dendrite growth/penetration, but it also affects how much electrolyte can be held within the separator (which in turn affects the electrochemical potential of the cell). Accordingly, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a separator with a mean flow pore diameter of 0.3-5 μm and a bubble point pore diameter of 3-20 μm in accordance with ASTM F 316 86, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum

or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

Tsukuda et al. does not teach (e) that the heat-and-humidity gelling fiber has a diameter of 1-6 μm or (f) that the content of ethylene in ethylene-vinyl alcohol copolymer is in the range of 20-50 mol%.

With respect to (e), it is noted that although Tsukuda et al. does not exemplify the fiber diameter of the gelling fiber (of the gelling resin) that one embodied thickness of the separator is 10 μm (col. 20, lines43-52). Accordingly, one of ordinary skill in the art would expect the fiber diameter of the gelling fiber (polyvinyl alcohol binder) to be no more than 10 μm, since it would be impossible to embody a separator that is 10 μm thick, wherein the binder is greater than 10 μm. Therefore, one of ordinary skill in the art, from the teaching of Tsukuda et al., would expect the binder to be 10 μm or less (which is seen at the very least close to the 6 μm embodied by the claimed invention). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a <u>prima facie</u> rejection is properly established when the difference in the range or value is minor. <u>Titanium Metals Corp. of Am. v. Banner</u>, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed

by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (In re Woodruff, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)).

Additionally, it is noted that the size of the gelling fiber is also a result effective variable, wherein it can be optimized with respect to producing a homogenous mixture with that of the other materials of the separator as well as with respect to desired thickness of the separator. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a gelling fiber having a diameter of 1-6 μm, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

With respect to (f), Callahan et al. teach of a separator to be used in a battery, wherein ethylene-vinyl alcohol copolymer is used (col. 1, lines 5-7). Specifically,

Callahan et al. teach that the preferred mole percent of ethylene used is between 27 to 49% (within the claimed limit) (col. 2, lines 45-50). The motivation for making a separator wherein the ethylene mole percent is within the range specified by Callahan et al., is that it would be one of the properties within the separator that provides good hydrophilicity and resists degradation (col. 1, lines 65-67). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use an ethylene-vinyl alcohol containing separator, wherein the mole percent of ethylene in ethylene-vinyl alcohol is 27-49%, as it would be one of the characteristics necessary to help establish good hydrophilicity and resist degradation (as taught by Callahan et al.).

Furthermore, Stockel also teaches a range that encompasses that of the claimed range. Stockel teaches of a battery separator with ethylene vinyl alcohol, wherein the copolymer should have a weight of percent of 40-60 of vinyl alcohol (col. 1, lines 8-16; col. 2, lines 61-67). This results in a weight percent of 10-90% of ethylene. Calculations are shown below to change weight percent to mole percent. (Legend: E corresponds to ethylene; VOH corresponds to vinyl alcohol)

$E : 28.05 g / mol$

$VOH : 44.05 g / mol$

$100 g\_basis$

$@10\_wt\%E$

$$10 gE * \frac{molE}{28.05 gE} = 0.36 molE$$

$$90 gVOH * \frac{molVOH}{44.05 g} = 2.04 molVOH$$

$$mol\%E = \frac{molE}{mol\_total} * 100\% = \frac{0.36 molE}{0.36 molE + 2.03 molVOH} * 100\% = 17 mol\%E$$

$@60\_wt\%E$

$$60 gE * \frac{molE}{28.05 gE} = 2.14 molE$$

$$40 gVOH * \frac{molVOH}{44.05 g} = 0.91 molVOH$$

$$mol\%E = \frac{molE}{mol\_total} * 100\% = \frac{2.14 molE}{2.14 molE + 0.91 molVOH} * 100\% = 70 mol\%E$$

Therefore, Stockel teaches the use of a mol% of ethylene between 17 and 70 mol%. The motivation for using ethylene to vinyl alcohol in such ratios is to provide sufficient mechanical strength and to ensure sufficient porosity (col. 2, lines 61-67). Therefore it would have been obvious to one or ordinary skill in the time the invention was made to use the mole percentages of ethylene in an ethylene-vinyl alcohol (as taught by Stockel and as applied to Tsukuda et al.) in order to provide a separator with sufficient porosity and mechanical strength.

At the very least, it is noted that Stockel sets forth that the ratio of ethylene and vinyl alcohol within ethylene vinyl alcohol is a result effective variable, wherein changing the amounts if each part within the compound would affect porosity as well as mechanical strength. Accordingly, at the very least, it would have been obvious to one

of ordinary skill in the art to optimize the amount of ethylene in ethylene-vinyl alcohol (i.e. to a range between 20-50 mol%, as claimed), since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

NOTE: With respect to (d), above, an alternate 103 rejection has been made using a secondary reference. Please see * below.

7. * Alternately, claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukuda et al., as evidenced by Bahar et al. in view of US 2003/0113619 (Zucker) and either Callahan et al. or Stockel.

As to claim 33, Tsukuda et al. teach of a porous separator for a lithium battery, wherein a nonwoven fabric is embodied as the type of porous base (abs). The separator taught by Tsukuda et al. is for use in a lithium battery, which has an organic electrolyte, as the battery fabricated with the examples and comparative examples are made of $LiClO_4$, ethylene carbonate, and diethylene carbonate (col. 51, lines 11-23). The porous base, wherein nonwoven fabric is embodied contains organic fibers (other

fiber) such as polypropylene and polyethylene fibers (col. 9, lines 33-57). Tsukuda et al. also embodies the use of a binder (gelling resin) when fibrillated polymeric organic fibers (polyethylene and polypropylene fit into this description) are used, wherein a polyvinyl alcohol, such as ethylene-vinyl alcohol copolymer is embodied (col. 13, lines 8-29 and 62-67).

It is noted that the gelling resin (binder of Tsukuda et al.) (a) is capable of gelling by heating in the presence of moisture and another fiber and (b) does gel under these conditions.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

“In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)

In the case of the instant application the basis for expectation of inherency is: With respect to (a) that the same gelling resin and other fiber as defined in Tsukuda et al. above are embodied by the instant application (see p 9, lines 17-28; p 11, lines 1-

15). (Note: It is interpreted that with the teaching of Tsukuda et al. that since ethylene-vinyl alcohol copolymer is a specific species in the generic polyvinyl alcohol species that all polyvinyl alcohols would act in the same manner under the same conditions, barring proof to the contrary.)

With respect to (b) same conditions of heat (by pressing) and humidity (water), as claimed, exist in Tsukuda et al., as water is included in the binder and that hot pressing occurs afterwards (see col. 13, lines 53-67; col. 17, lines 50-65).

The Examiner requires applicant to provide that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product.

Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

It is noted that the porous film has a maximum pore diameter of 10 μm, as detected using ASTM F-316-80 bubble point method and nonwoven fabric base has a maximum pore diameter of 20 μm (col. 5, lines 50-65).

It is noted that such a teaching (c) inherently embodies a bubble point pore diameter of 3-20 μm in accordance with ASTM F 316 86. Although the use of an ASTM F 316 86 standard is not specifically the characteristic is still inherent.

With respect to (c), the basis for inherency is that the tests of ASTM F 316 86 and that of the used ASTM F-316-80 measure the same thing and would thus report bubble point values that are similar. Therefore, the bubble point diameters of Tsukuda et al. (with one specific data point at 4 μm, as in examples 120-124) should be close to, if not identical to that of the claim.

However, it is noted that an alternate obviousness rejection is made if it shown that Tsukuda et al.'s separator is shown not to inherently have the characteristics of a 0.3-5 μm and a bubble point pore diameter of 3-20 μm in accordance with ASTM F 316 86.

Alternately, bubble point diameter is seen to be a result effective variable, and accordingly, one of ordinary skill in the art would have found it obvious to optimize it. The bubble point diameter (corresponding to the maximum pore diameter, as evidenced by Bahar et al. (col. 9, lines 55-67; col. 10, lines 1-3)) is a result effective variable, wherein its size effects whether or not dendrites can penetrate the separator easily. Accordingly, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a separator with a bubble point pore diameter of 3-20 μm in accordance with ASTM F 316 86, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter

encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

It can be interpreted that Tsukuda et al. does not specifically state that (d) the mean flow pore diameter is between 0.3- 5 μm.

With respect to (d), Zucker teaches of a melt blow battery separator, which can be used in a lithium battery (title; para 008). It is taught that the average desired pore size is in the range of 0.3-50 microns or more narrowly 1-25 microns (para 0010). (It is noted that the separator of Zucker is similar to that of Tsukuda et al., polyolefins, such as polyethylene and polypropylene (para 0011).) (It is reminded that Bahar et al., relied upon as an evidentiary piece, links mean flow pore diameter to the mean pore size (col. 9, lines 55-67; col. 10, lines 1-3), wherein such an interpretation is relied upon). The motivation for making a battery with the characteristics as disclosed by Zucker (i.e. the claimed pore size) is in order to create a melt blown nonwoven separator having sufficient mechanical properties and sufficiently small pores for the use as a separator in a battery (para 0006). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use the average pore size in the range disclosed Zucker et al. (wherein 0.3 and 1 microns, both of which fit in the range of the claimed instant application) in order to create a separator with sufficient mechanical properties and sufficiently small pores in order to operate well as a battery separator.

Tsukuda et al. does not teach (e) that the heat-and-humidity gelling fiber has a diameter of 1-6 μm or (f) that the content of ethylene in ethylene-vinyl alcohol copolymer is in the range of 20-50 mol%.

With respect to (e), it is noted that although Tsukuda et al. does not exemplify the fiber diameter of the gelling fiber (of the gelling resin) that one embodied thickness of the separator is 10 μm (col. 20, lines43-52). Accordingly, one of ordinary skill in the art would expect the fiber diameter of the gelling fiber (polyvinyl alcohol binder) to be no more than 10 μm, since it would be impossible to embody a separator that is 10 μm thick, wherein the binder is greater than 10 μm. Therefore, one of ordinary skill in the art, from the teaching of Tsukuda et al., would expect the binder to be 10 μm or less (which is seen at the very least close to the 6 μm embodied by the claimed invention). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a <u>prima facie</u> rejection is properly established when the difference in the range or value is minor. <u>Titanium Metals Corp. of Am. v. Banner</u>, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art <u>unless</u> there is evidence indicating such ranges is critical. <u>In re Boesch</u>, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). <u>In re Aller</u>, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). <u>In re Hoeschele</u>, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (In re Woodruff, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)).

Additionally, it is noted that the size of the gelling fiber is also a result effective variable, wherein it can be optimized with respect to producing a homogenous mixture with that of the other materials of the separator as well as with respect to desired thickness of the separator. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a gelling fiber having a diameter of 1-6 µm, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

With respect to (f), Callahan et al. teach of a separator to be used in a battery, wherein ethylene-vinyl alcohol copolymer is used (col. 1, lines 5-7). Specifically, Callahan et al. teach that the preferred mole percent of ethylene used is between 27 to 49% (within the claimed limit) (col. 2, lines 45-50). The motivation for making a separator wherein the ethylene mole percent is within the range specified by Callahan et al., is that it would be one of the properties within the separator that provides good hydrophilicity and resists degradation (col. 1, lines 65-67). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was

made to use an ethylene-vinyl alcohol containing separator, wherein the mole percent of ethylene in ethylene-vinyl alcohol is 27-49%, as it would be one of the characteristics necessary to help establish good hydrophilicity and resist degradation (as taught by Callahan et al.).

Furthermore, Stockel also teaches a range that encompasses that of the claimed range. Stockel teaches of a battery separator with ethylene vinyl alcohol, wherein the copolymer should have a weight of percent of 40-60 of vinyl alcohol (col. 1, lines 8-16; col. 2, lines 61-67). This results in a weight percent of 10-90% of ethylene. Calculations are shown below to change weight percent to mole percent. (Legend: E corresponds to ethylene; VOH corresponds to vinyl alcohol)

$$E : 28.05 g/mol$$
$$VOH : 44.05 g/mol$$
$$100g\_basis$$
$$@10\_wt\%E$$
$$10gE * \frac{molE}{28.05gE} = 0.36molE$$
$$90gVOH * \frac{molVOH}{44.05g} = 2.04molVOH$$
$$mol\%E = \frac{molE}{mol\_total} * 100\% = \frac{0.36molE}{0.36molE + 2.03molVOH} * 100\% = 17mol\%E$$
$$@60\_wt\%E$$
$$60gE * \frac{molE}{28.05gE} = 2.14molE$$
$$40gVOH * \frac{molVOH}{44.05g} = 0.91molVOH$$
$$mol\%E = \frac{molE}{mol\_total} * 100\% = \frac{2.14molE}{2.14molE + 0.91molVOH} * 100\% = 70mol\%E$$

Therefore, Stockel teaches the use of a mol% of ethylene between 17 and 70 mol%. The motivation for using ethylene to vinyl alcohol in such ratios is to provide sufficient mechanical strength and to ensure sufficient porosity (col. 2, lines 61-67). Therefore it would have been obvious to one or ordinary skill in the time the invention was made to use the mole percentages of ethylene in an ethylene-vinyl alcohol (as taught by Stockel and as applied to Tsukuda et al.) in order to provide a separator with sufficient porosity and mechanical strength.

At the very least, it is noted that Stockel sets forth that the ratio of ethylene and vinyl alcohol within ethylene vinyl alcohol is a result effective variable, wherein changing the amounts if each part within the compound would affect porosity as well as mechanical strength. Accordingly, at the very least, it would have been obvious to one of ordinary skill in the art to optimize the amount of ethylene in ethylene-vinyl alcohol (i.e. to a range between 20-50 mol%, as claimed), since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

8. Claims 34, 35, 37-44, 46, 49-56, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over either (1) Tsukuda et al., as evidenced by Bahar et al., in view of Callahan et al. or Stockel (as applied to claim 33), or (2) Tsukuda et al., as evidenced by Bahar et al. in view of (Zucker) and Callahan et al. or Stockel (as applied to claim 33).

As to claim 34, Tsukuda et al. teach that the polyvinyl alcohol binder (gelling resin) is fibrous and forms on the surface of the porous base wherein the fibers (and thus their surfaces) are heat-meltable (col. 13, lines 22-29 and 54-61).

As to claim 35, Tsukuda et al. teach that the polyvinyl alcohol (gelling resin) is 50% or less (preferably 30% or less) in the porous base (col. 13, lines 35-38).

As to claims 37-38, Tsukuda et al. teach that the other fibers (organic fibers, such as polyolefins, which encompasses polypropylene and polyethylene) are fibrillated to a diameter of 1 μm or less (col. 11, lines 47-53).

As to claim 39, Tsukuda et al.'s embodies the use of organic (other) fibers such as polypropylene and polyethylene fibers (col. 9, lines 33-57). (Polyethylene is an olefin fiber.)

As to claim 40, Tsukuda et al. teach that the organic fibers (other fiber) is in a weight percent of 5-100%, while the weight percent of the polyvinyl alcohol (gelling resin) is 50% weight or less (more preferably 30% weight or less) (col. 9, lines 58-60; col. 14, lines 35-38). Accordingly, in a 100 part by weight sample, embodied amounts of gelling resin would be 30 parts and 50 parts, wherein 70 parts and 50 parts of the

other fiber would follow (as necessary for mass balance). These two data points read on the claimed ratio, as shown by the calculations below.

$$100\_wt\_part\_example$$

$$\frac{50\_parts\_other\_fiber}{50\_parts\_resin} = \frac{100\_parts\_other\_fiber}{100\_parts\_resin}$$

$$\frac{70\_parts\_other\_fiber}{30\_parts\_resin} = \frac{233\_parts\_other\_fiber}{100\_parts\_resin}$$

It is noted that although the strength of the other fiber is not specifically mentioned, this characteristic is inherent. The basis for inherency is that the strength of a fiber is dependent on the material of the fiber. Therefore, since Tsukuda et al. embodies the same fiber (such as polypropylene and polyethylene, which is mentioned for its strength) (col. 9, lines 33-40) as that of the instant application (see p 35 of the Specification, lines 1-7). Since the materials are the same, the same strength characteristic would be inherent. (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

As to claim 41, Tsukuda et al. teach that the organic fibers (other fiber) is in a weight percent of 5-100%, while the weight percent of the polyvinyl alcohol (gelling resin) is 50% weight or less (more preferably 30% weight or less) (col. 9, lines 58-60; col. 14, lines 35-38). Accordingly, in a 100 part by weight sample, embodied amounts of gelling resin would be 30 parts and 50 parts, wherein 70 parts and 50 parts of the other fiber would follow (as necessary for mass balance). These two data points read on the claimed ratio, as shown by the calculations below.

$$100\_wt\_part\_example$$

$$\frac{50\_parts\_other\_fiber}{50\_parts\_re\sin} = \frac{100\_parts\_other\_fiber}{100\_parts\_re\sin}$$

$$\frac{70\_parts\_other\_fiber}{30\_parts\_re\sin} = \frac{233\_parts\_other\_fiber}{100\_parts\_re\sin}$$

It is noted although the fact that the other fiber is a heat-melting fiber that does not substantially shrink is not specifically mentioned, these characteristics are inherent. The basis for inherency is that the strength of a fiber is dependent on the material of the fiber. As mentioned before Tsukuda et al.'s organic fibers (other fibers) are polyolefins (with polypropylene and polyethylene particularly embodied) (col. 11, lines 48-53). The instant application teaches that a polyolefin is used as the heat-melting fiber (p16, lines 36-37; p17, line 1). Accordingly, since the materials are the same, the other fiber, which also serves as including a heat-melting fiber is seen to not substantially shrink at a temperature that causes the heat-and-humidity gelling resin to gel under heat and humidity to fix the other fiber, as the material embodied by Tsukuda et al. and the instant application are the same. (It is noted, that the gelling resin is the same, too, as both Tsukuda et al. and the instant application embody a ethylene-vinyl alcohol copolymer, see col. 13, lines 62-67 and p9, lines 25-28, respectively.) (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

As to claim 42, Tsukuda et al. teach of an example with micro-glass, polyimide fibers (synthetic pulp), polyethylene/polypropylene composite (other fiber), as well as a polyvinyl alcohol (gelling resin) (example 97, col. 42, lines 10-30). (The polyimidie fibers are taken to be synthetic, as they are man made, see example 74, lines 59-66).

As to claim 43, Tsukuda et al.'s example 97 teaches the following ratio: micro-glass:polyimidie:composite:polyvinyl alcohol is 40:15:35:10. Accordingly, with respect to a 100 weight sample, the example falls within the claimed range, as shown by the calculation below.

$$100\_wt\_part\_example$$
$$\frac{15\_parts\_polyimide}{10\_parts\_resin} = \frac{150\_parts\_polyimide}{100\_parts\_resin}$$

As to claim 44, it is noted that although Tsukuda et al. does not exemplify the fiber diameter of the gelling fiber (of the gelling resin) that the other fibers (organic fibers, such as polyolefins, which encompasses polypropylene and polyethylene) are fibrillated to a diameter of 1 μm or less (col. 11, lines 47-53). Additionally, it is noted that one embodied thickness of the separator is 10 μm (col. 20, lines43-52). Accordingly, one of ordinary skill in the art would expect the fiber diameter of the gelling fiber (polyvinyl alcohol binder) to be no more than 10 μm, since it would be impossible to embody a separator that is 10 μm thick, wherein the binder is greater than 10 μm. Accordingly, the average fiber diameter of the gelling fiber (10 μm or less) and other fiber (1 μm) would be expected to be 10 μm or less. Additionally, it is noted that the size of the gelling fiber is also a result effective variable, wherein it can be optimized with respect to producing a homogenous mixture with that of the other materials of the separator as well as with respect to desired thickness of the separator. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have an average fiber diameter of the gelling fiber and the other fiber of 10 μm or

less, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

As to claim 46, Tsukuda et al. teach the battery as disclosed above. It is notable that split fabric is embodied for bonding the nonwoven fabric (col. 17, lines 34-41). It is not stated that the gelling fiber is provided by splitting a splittable composite fiber that contains the heat-and-humidity gelling resin and another resin, which are adjacent to each other in a cross-section of the fiber. However, this is seen as a product-by-process limitation, wherein Tsukuda et al. embody the use of a splittable fabric as well as the gelling resin. Accordingly, the product of Tsukuda et al. is seen to be the same as that of the instant application.

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is

unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

"The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature" than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.

Note: For an alternate 103 rejection using a secondary piece for the splittable composite fiber, see ** below.

As to claim 49, Tsukuda et al. teach that the organic fibers (other fibers) are cut to a fiber length of 5 mm or less, preferably 3 mm or less (col. 12, lines 45-48). It is noted that the specific manner in which the nonwoven sheet is formed, it is said that a wet sheet is obtained (col. 6, lines 66-67; col. 7, lines 1-5), thus indicating wetlaying of some sort. It is additionally noted that wetlaying is a product by process limitation, wherein the product of Tsukuda et al. is the same as that of the instant application.

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability

of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

"The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature" than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.

As to claim 50, as previously stated, Tsukuda et al. teach that a wet sheet is obtained [from the organic fibers] (col. 6, lines 66-67; col. 7, lines 1-5), thus indicating wetlaying of some sort. It is noted that the separator using a polyvinyl alcohol (gelling resin) is uniform (col. 60, lines 34-36). Accordingly, the product is taken substantially uniform with respect to the gelling resin in the separator, barring specification as to what constitutes "substantially uniformly present." It is noted that the use of a splittable composite fiber and splitting it during wetlaying to provide the gelling fiber is a product by process limitation, wherein the product of Tsukuda et al. is the same as that of the

instant application (as the both an other fiber as well as gelling resin exist in the final product).

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

"The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature" than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.

Note: For an alternate 103 rejection using a secondary piece for the splittable composite fiber, see *** below.

As to claim 51, Tsukuda et al. teach that the polyvinyl alcohol binder (gelling resin) forms as a film on the surface of the porous base (col. 13, lines 22-29).

As to claim 52, Tsukuda et al. does not specifically teach an area of which the film gel covers the surface of the nonwoven (40-90%). However, Tsukuda et al. does mention that such a characteristic is a result effective variable. Tsukuda et al. specifically teach that the polyvinyl alcohol is applied to the base by impregnation, coating, or spraying (col. 13, lines 22-29). All of the three aforementioned methods are applied to the surface of separator (which is why the gel film is formed on the surface). Tsukuda et al. also teach of a preferred weight of the porous base that the polyvinyl alcohol takes up (50% or less, more preferably 30% or less). It is further noted that if the polyvinyl alcohol binder is more than 50% of the porous base, the area of the film formed on the surface of the base becomes too large and the pores necessary for ion permeation are apt to be unevenly distributed, and, in some cases the porous base becomes filmy and the pores are ruptured (col. 13, lines 38-44). However, it is also noted that the polyvinyl alcohol acts as a binder and makes pores small for the separator, which imparts excellent mechanical strength including tensile strength, tear strength, and penetration strength (col. 13, lines 44-54). Accordingly, the amount of polyvinyl alcohol binder on the surface of the separator is a result effective variable between imparting proper mechanical strength without disrupting pores necessary for ion permeation. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the amount of polyvinyl alcohol used, which thus optimizes the amount of film gel on the surface of the nonwoven base, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has

been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

As to claim 53, Tsukuda et al., although no test is completed wherein an angle of dechlorinated water dropped on the surface is taken after 5 seconds of dropping the water, if done the product of Tsukuda et al. would inherently yield the characteristic of displaying an angle of 60 degrees or less. The basis for inherency is that the product of Tsukuda et al. is the same as that claimed by the instant application. Therefore this characteristic would be expected if the product of Tsukuda et al. were subjected to the same conditions. (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

As to claims 54 and 55, Tsukuda et al.'s separator inherently has a puncture strength of 2 N or more and a standard deviation of 1.1 N or less (as required by claim 54) and a variation index of puncture strength of 0.165 or less. The basis for inherency is that the product of Tsukuda et al. is the same as that claimed by the instant application. Therefore these characteristic would be expected if the product of Tsukuda et al. were subjected to the same conditions. (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

As to claim 56, Tsukuda et al.'s separator has a thickness of preferably between 20-60 μm (col. 20, lines 43-47). Although the specific volume is not specifically stated (1.2 to 2.5 cm^3/g), such a characteristic is inherent. The basis of inherency is that the structure of Tsukuda et al. is the same as that taught by the instant application. (As set forth in the rejection to claim 33, similar materials and pore sizes are embodied. As set forth in the rejection to claim 35, the ratio of materials used is similar. Additionally, the size of the other fibers used is similar, too, as set forth in the rejection to claims 37.) Accordingly, since the materials used, pore size of the resulting separator, the ratio of the materials used, as well as the physical attributes of the materials are all similar, it is expected that the final product would have the same specific volume, barring proof to the contrary. (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

If it is shown that such a characteristic is not inherent, it would be alternately obvious. As previously stated, the product of the instant application and that of Tsukuda et al. are similar (similar materials use, similar sizes, similar ratios). Accordingly, any differences in the two products are seen to be small. It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205

USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (In re Woodruff, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)).

Additionally, it is noted that specific volume is a result effective variable, wherein it can be optimized with respect porosity (i.e. smaller porosity would yield a separator with better mechanical features, however larger porosity would yield a separator that has a larger capacity to hold electrolyte). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make a separator with a specific volume of 1.2 to 2.5 cm^3/g, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

As to claim 63, Tsukuda et al.'s separator is used in a lithium battery, which has an organic electrolyte, as the battery fabricated with the examples and comparative

examples are made of $LiClO_4$, ethylene carbonate, and diethylene carbonate (col. 51, lines 11-23).

9. Claims 46-48 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over either (a) Tsukuda et al. in view of either Callahan et al. or Stockel as evidenced by Bahar et al. or (b) Tsukuda et al. in view of Zucker and either Callahan et al. or Stockel, as evidenced by Bahar et al., as applied to claims 33, 34, and 49, in further view of US 2002/0037408 (Tsutsui et al.).

**As to claim 46, Tsukuda et al. teach a product similar to that of the instant application (with respect to materials used, size of materials, and ratio of materials). However, Tsukuda et al. does not mention that a splittable composite fiber is used to provide the gelling fiber. If it is shown that the use of a splittable fiber to provide the gelling fiber changes the structure of the final product, Tsutsui et al. is further relied upon to show why the use of such would have been obvious.

Tsutsui et al. teach the use of a splittable fiber using polyolefins (polyethylene and polypropylene are the two embodied components), wherein ethylene-vinyl alcohol copolymer (gelling resin) is added to at least one of the components in a battery separator (para 0001 and 0009-0010). This accordingly would create a splittable fiber with a gelling resin and another resin adjacent to each other (wherein the gelling resin is only added to one of the components, as seen in fig. 1). The motivation for using the splittable fiber taught by Tsutsui et al. in the battery of Tsukuda et al. is that such a fiber is easier to split, and a fine fiber is easily formed by splitting, thus making it producible using less pressure and solving problems like deterioration of uniformity of the fiber

structure and opening of the penetrated part, thus resulting in good surface qualities and uniformity (para 0061-0062). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use the splittable fiber of Tsutsui et al. in order to have a sheet that is easier to make (as less pressure is required to be applied) and in order to solve problems such as deterioration of uniformity of the fiber structure and opening of the penetrated part, resulting in good surface qualities and uniformity. Furthermore, since Tsutsui et al. teach of using a splittable fiber in a battery separator (wherein the materials used to make up such a fiber (polypropylene, polyethylene, and a polyvinyl alcohol) are used in Tsukuda et al.), it would have been obvious to one having ordinary skill in the art at the time the invention was made to use such a splittable fiber, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416.

As to claim 47, it is noted that Tsutsui et al. is relied upon to teach the use of a splittable composite fiber comprising a gelling resin and another resin adjacent to one another in a cross-section of the fiber(as within the rejection of claim 46). This splittable fiber provides the gelling fiber.

The combination does not specifically mention (a) the strength of the other fiber (4.5 cN/dtex), (b) that the other fiber is in a range of 10-200 parts per mass per 100 parts of the composite fiber, (c) a heat-melting fiber that does not substantially shrink at a temperature that causes the heat-and-humidity gelling resin to gel under heat and

humidity, wherein (d) the heat-melting fiber is in a range of 10-200 parts per mass per 100 parts of the composite fiber.

With respect to (a), the strength of the other fiber is inherent. The basis for inherency is that the strength of a fiber is dependent on the material of the fiber. Therefore, since Tsukuda et al. embodies the same fiber (such as polypropylene and polyethylene, which is mentioned for its strength) (col. 9, lines 33-40) as that of the instant application (see p 35 of the Specification, lines 1-7). Since the materials are the same, the same strength characteristic would be inherent. (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

With respect to (c), although the fact that the other fiber is a heat-melting fiber that does not substantially shrink is not specifically mentioned, these characteristics are inherent. The basis for inherency is that the strength of a fiber is dependent on the material of the fiber. As mentioned before Tsukuda et al.'s organic fibers (other fibers) are polyolefins (with polypropylene and polyethylene particularly embodied) (col. 11, lines 48-53). The instant application teaches that a polyolefin is used as the heat-melting fiber (p16, lines 36-37; p17, line 1). Accordingly, since the materials are the same, the other fiber, which also serves as including a heat-melting fiber is seen to not substantially shrink at a temperature that causes the heat-and-humidity gelling resin to gel under heat and humidity to fix the other fiber, as the material embodied by Tsukuda et al. and the instant application are the same. (It is noted, that the gelling resin is the same, too, as both Tsukuda et al. and the instant application embody a ethylene-vinyl

alcohol copolymer, see col. 13, lines 62-67 and p9, lines 25-28, respectively.) (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

With respect to (b) and (d), (taking the other fiber and heat-melting fiber to be the same fiber), the composition of the other fiber/heat-melting fiber with respect to a composite fiber is not clear with respect to the combination. However it is noted that the amount of gelling resin (polyvinyl alcohol binder) to use in a separator is a result effective variable, and accordingly adding the correct optimized amount would also optimize the other fiber/heat-melting fiber. It is stated in Tsukuda et al. that using too much binder causes a film to be formed on the surface of the base to become too large, which disturbs the pores necessary for ion permeation are apt to be unevenly distributed, and, in some cases the porous base becomes filmy and the pores are ruptured (Tsukuda et al. col. 13, lines 38-44). However, it is also noted that the polyvinyl alcohol acts as a binder and makes pores small for the separator, which imparts excellent mechanical strength including tensile strength, tear strength, and penetration strength (Tsukuda et al. col. 13, lines 44-54). Accordingly, the amount of polyvinyl alcohol binder to use in a separator is a result effective variable between imparting proper mechanical strength without disrupting pores necessary for ion permeation. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the amount of polyvinyl alcohol used (which would in turn provide the optimized balance of other/heat-melting fibers), since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has

been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

As to claim 48, it is noted that Tsutsui et al. is relied upon to teach the use of a splittable composite fiber comprising a gelling resin and another resin adjacent to one another in a cross-section of the fiber(as within the rejection of claim 46). This splittable fiber provides the gelling fiber.

The combination does not specifically mention (a) the strength of the other fiber (4.5 cN/dtex), (b) that the other fiber is in a range of 6.25-120 parts per mass per 100 parts of the composite fiber, (c) a heat-melting fiber that does not substantially shrink at a temperature that causes the heat-and-humidity gelling resin to gel under heat and humidity, wherein (d) the heat-melting fiber is in a range of 12.5 to 120 parts per mass per 100 parts of the composite fiber, and that (e) there is further a synthetic pulp in a range of 6.25 to 120 parts by mass.

With respect to (a), the strength of the other fiber is inherent. The basis for inherency is that the strength of a fiber is dependent on the material of the fiber. Therefore, since Tsukuda et al. embodies the same fiber (such as polypropylene and polyethylene, which is mentioned for its strength) (col. 9, lines 33-40) as that of the

instant application (see p 35 of the Specification, lines 1-7). Since the materials are the same, the same strength characteristic would be inherent. (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

With respect to (c), although the fact that the other fiber is a heat-melting fiber that does not substantially shrink is not specifically mentioned, these characteristics are inherent. The basis for inherency is that the strength of a fiber is dependent on the material of the fiber. As mentioned before Tsukuda et al.'s organic fibers (other fibers) are polyolefins (with polypropylene and polyethylene particularly embodied) (col. 11, lines 48-53). The instant application teaches that a polyolefin is used as the heat-melting fiber (p16, lines 36-37; p17, line 1). Accordingly, since the materials are the same, the other fiber, which also serves as including a heat-melting fiber is seen to not substantially shrink at a temperature that causes the heat-and-humidity gelling resin to gel under heat and humidity to fix the other fiber, as the material embodied by Tsukuda et al. and the instant application are the same. (It is noted, that the gelling resin is the same, too, as both Tsukuda et al. and the instant application embody a ethylene-vinyl alcohol copolymer, see col. 13, lines 62-67 and p9, lines 25-28, respectively.) (Please see the rejection of claim 33 for the Office's policy on inherent characteristics.)

With respect to (b), (d), and (e), it is noted that with the interpretation above, the other fiber and heat-melting fiber are the same fiber. It is also noted that Tsukuda et al. teach of an example with micro-glass, polyimide fibers (synthetic pulp), polyethylene/polypropylene composite (other fiber), as well as a polyvinyl alcohol (gelling resin) (example 97, col. 42, lines 10-30). (The polyimidie fibers are taken to be

synthetic, as they are man made, see example 74, lines 59-66). However, the composition of the other fiber/heat-melting fiber and synthetic fiber with respect to a composite fiber is not clear with respect to the combination.

However it is noted that the amount of gelling resin (polyvinyl alcohol binder) to use in a separator, as well as the amount of the other materials used in the porous base, is a result effective variable, and accordingly adding the optimized ratios of each would provide an optimized product. With respect to the binder (gelling resin), it is stated in Tsukuda et al. that using too much binder causes a film to be formed on the surface of the base to become too large, which disturbs the pores necessary for ion permeation are apt to be unevenly distributed, and, in some cases the porous base becomes filmy and the pores are ruptured (Tsukuda et al. col. 13, lines 38-44). However, it is also noted that the polyvinyl alcohol acts as a binder and makes pores small for the separator, which imparts excellent mechanical strength including tensile strength, tear strength, and penetration strength (Tsukuda et al. col. 13, lines 44-54). Accordingly, the amount of polyvinyl alcohol binder to use in a separator is a result effective variable between imparting proper mechanical strength without disrupting pores necessary for ion permeation. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the amount of polyvinyl alcohol used (which would in turn provide the optimized balance of other/heat-melting fibers), since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim

are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). (It is noted that once the ratio of the polyvinyl alcohol binder has been optimized, both the other/heat-melting fiber and the synthetic pulp ratios follow, as per Tsukuda et al.'s example 97. The ratio is as follows micro-glass:polyimidie:composite:polyvinyl alcohol is 40:15:35:10. The amount of polyimide (synthetic pulp) is about 43% of the other/heat-melting fiber. Accordingly, if proper usage of polyvinyl alcohol binder to other/heat-melting fiber yielded 12.5, 120, or anywhere between, the synthetic pulp would follow at a 5.38 to 51.43 parts, as the ratio of synthetic pulp to heat-melting fiber has been set within the teaching of Tsukuda et al.)

***As to claim 50, as previously stated, Tsukuda et al. teach that a wet sheet is obtained [from the organic fibers] (col. 6, lines 66-67; col. 7, lines 1-5), thus indicating wetlaying of some sort. It is noted that the separator using a polyvinyl alcohol (gelling resin) is uniform (col. 60, lines 34-36). Accordingly, the product is taken substantially uniform with respect to the gelling resin in the separator, barring specification as to what constitutes "substantially uniformly present." However, Tsukuda et al. does not mention that a splittable composite fiber is used to provide the gelling fiber. If it is shown that the use of a splittable fiber to provide the gelling fiber changes the structure of the final

product, Tsutsui et al. is further relied upon to show why the use of such would have been obvious.

Tsutsui et al. teach the use of a splittable fiber using polyolefins (polyethylene and polypropylene are the two embodied components), wherein ethylene-vinyl alcohol copolymer (gelling resin) is added to at least one of the components in a battery separator (para 0001 and 0009-0010). The motivation for using the splittable fiber taught by Tsutsui et al. in the battery of Tsukuda et al. is that such a fiber is easier to split, and a fine fiber is easily formed by splitting, thus making it producible using less pressure and solving problems like deterioration of uniformity of the fiber structure and opening of the penetrated part, thus resulting in good surface qualities and uniformity (para 0061-0062). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use the splittable fiber of Tsutsui et al. in order to have a sheet that is easier to make (as less pressure is required to be applied) and in order to solve problems such as deterioration of uniformity of the fiber structure and opening of the penetrated part, resulting in good surface qualities and uniformity. Furthermore, since Tsutsui et al. teach of using a splittable fiber in a battery separator (wherein the materials used to make up such a fiber (polypropylene, polyethylene, and a polyvinyl alcohol) are used in Tsukuda et al.), it would have been obvious to one having ordinary skill in the art at the time the invention was made to use such a splittable fiber, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416.

Response to Arguments

10. Applicant's arguments filed January 16, 2009 have been fully considered but they are not persuasive.

Applicant argues that Tsukuda et al. fails to disclose (a) the ethylene content in ethylene-vinyl alcohol copolymer (20-50%) and (b) the particular diameter of the gelling fiber (1-6 μm).

Examiner respectfully disagrees with Applicant's position.

With respect to (a), Examiner submits that such a limitation is a newly added limitation and that Callahan et al. and Stockel have been used to render such a limitation obvious. With respect to (b), Examiner submits that it has been set forth within the rejection as to how Tsukuda et al. would render such a claim limitation obvious (see subsection (e) as labeled within the rejections to claim 33). Applicant does not point out how the claimed size would not be obvious to one of ordinary skill in the art (i.e. in how an embodiment of a separator thickness of 10 μm, wherein the fibers must be smaller than that, wherein a value of less than 10 μm would be reasonably be close to that of the upper limit of the claimed range or how such a characteristic is no more than an optimization of a result effective variable). Accordingly, such arguments are not seen to be persuasive, and the rejection of record is maintained.

Applicant argues that Bahar et al. argues that Bahar et al. does not cure the deficiencies of Tsukuda.

Examiner would like to clarify the fact that Bahar et al. is merely relied upon as an evidentiary piece and is not used to teach specific characteristics of the claimed

invention. Therefore, such arguments are misguided. Additionally, as set forth above, the arguments as to Tsukuda et al. are not found to be persuasive, thus the rejection of record is maintained.

With respect to the arguments regarding the 103 rejections, Applicant argues that the prior art used to render obvious the rejected claims (Zucker et al. and Tsutsui et al.) do not cure the deficiencies of the primary reference (Tsukuda et al.). Applicant does not argue how the combination is not proper. Therefore, the Examiner maintains the obviousness rejections and upholds the rejection of the primary reference, as above.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENIA WANG whose telephone number is (571)272-4942. The examiner can normally be reached on 7 - 4:30 Mon. - Thurs., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/E. W./
Examiner, Art Unit 1795

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795